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ABSTRACT

This booklet is designed to assist prospective and established property owners in the selection, planning, and management of lake lands. It is organized into three parts: (1) selection and preparation of a building site; (2) property management; and (3) community development. These sections outline some basic guidelines for land development and maintenance by not only individual property owners, but also by developers and communities. In addition, certain Michigan state ordinances which apply to the lake property are identified. (Author/BB)

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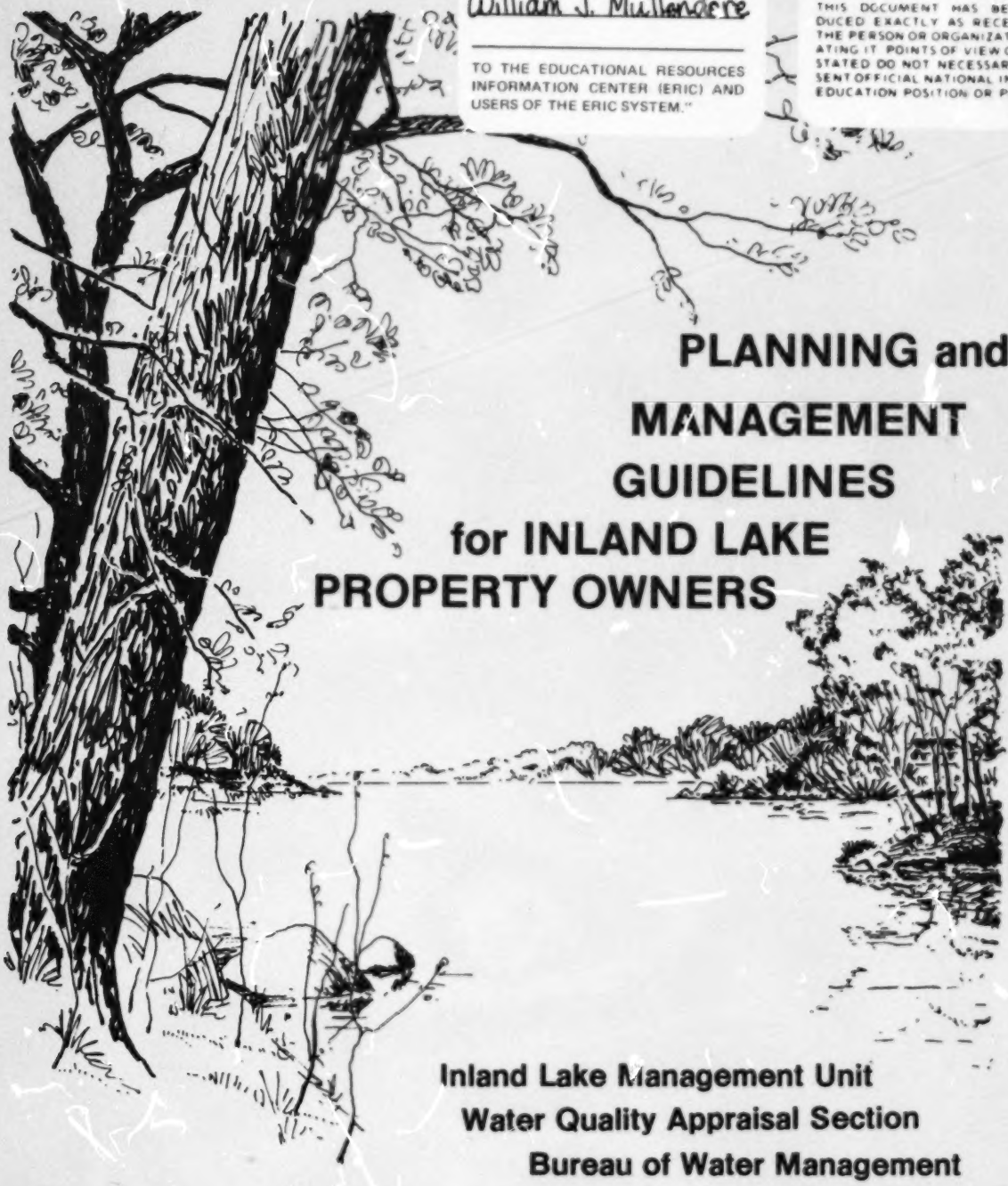

PLANNING and MANAGEMENT GUIDELINES for INLAND LAKE PROPERTY OWNERS

Inland Lake Management Unit
Water Quality Appraisal Section
Bureau of Water Management
Michigan Department of Natural Resources
Water Resources Commission

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A lake is the landscape's most beautiful and expressive feature. It is the earth's eye; looking into which the beholder measures the depth of his own nature.

from **Walden**
by Henry David Thoreau

INTRODUCTION

Every year thousands of Michigan's citizens choose to purchase property and build homes or cottages on inland lakes. Each decision is extremely important because it represents not only an investment in premium real estate, but also an investment in the future of a natural resource — an inland lake. The combination of quality residential development and the prospect of a good future for an inland lake imparts high and stable values to lake property. If for no other reason than a financial one, it is necessary that the buyer select, prepare and care for lake property with a sensitivity reminiscent of Thoreau, for deterioration of a lake and its shoreline can spell severe monetary loss to the private investor (the property owner) and to the mutual investor (the citizens of the State).

Those readers who already own lake property are probably aware of the relationship between real estate value and the quality of the lake environment. No doubt many have entertained the nightmare in which their lake becomes infested with pollutants, overgrown with algae and is ultimately restricted from human use. It is sad to note that in the past several decades some lake property owners in Michigan have actually experienced it!

While scientists generally agree that most inland lakes are naturally destined to extinction, they also hasten to add that unwise land and water use practices can greatly accelerate the aging process. The signs of lake aging are not hard to recognize; for example, heavy growths of aquatic weeds and thick deposits of sediments are indicators that the process may be well along.

How fast these materials accumulate depends on the amount of chemical nutrients and sediment which is carried into the lake by runoff. Studies have repeatedly shown that the streets, lawns, roofs and parking lots in areas of residential development contribute large amounts of these substances to runoff. As the density of development increases, both the total amount of runoff and the contaminants in it increase drastically. **Is this avoidable?** Actually much of it is if we take care (1) that development of lake property is guided by sound principles of land planning and (2) that once property is developed, owners exercise land management practices which insure good quality runoff and a stable environment.

This booklet is designed to assist prospective and established property owners in the selection, planning and management of lake lands. It is organized into three sections:

I Selection and Preparation of a Building Site.
II Property Management
III Community Development

These sections outline some basic guidelines for land development and maintenance by not only individual property owners, but by developers and communities as well. In addition, certain State ordinances which apply to lake property are identified. The illustrations and text are meant to be representative of Michigan inland lakes as a whole, and any resemblance to specific lakes living or dead is purely coincidental.

This publication was prepared under a contract from the Michigan Department of Natural Resources, Bureau of Water Management, and was funded through a grant to the DNR from the Upper Great Lakes Regional Commission. DNR members of the Inland Lake Management Unit, Water Quality Appraisal Section, initiated and guided the project and they include John Robinson, Dennis P. Tierney and Albert Massey. Willard Bosserman, Roscommon and Crawford County Extension Agent, Michigan State University Cooperative Extension Service, helped formulate the project.

wmm

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Dennis P. Tierney and Albert Massey, Coordinators

PART I

SELECTION and PREPARATION of a BUILDING SITE

WETLANDS

Though less attractive than sandy shorelines, wetlands are nevertheless used as building sites but often to the detriment of both property and environment. . .

For instance. . .

It is often necessary to place landfill over the muck (organic) soil. The weight of the fill plus that of the buildings on it can cause surface settling resulting in structural damage to buildings. . .

And. . .

Organic soils are ineffective in removing nutrients such as nitrogen and phosphorus from septic system drainage. As a result, these chemicals seep into the lake.

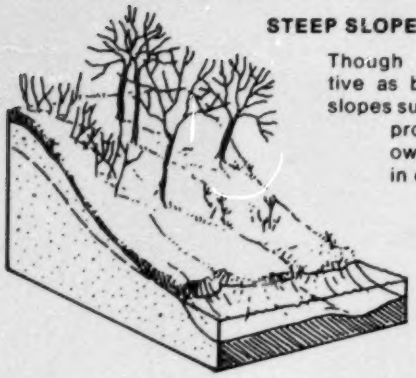
In addition. . .

It is often necessary to dredge a channel to provide boat access to the lake. Water in channels does not mix well with lake water and tends to grow stagnant. With the addition of nutrients from septic seepage and yard runoff, wetland channels will nurture lush growths of algae.

Finally. . .

It is important to remember that filling and dredging of wetlands spells destruction of habitats for waterfowl, beavers, racoons, frogs, pike, bass and many other creatures, which together constitute a highly important part of the natural character of a lake.

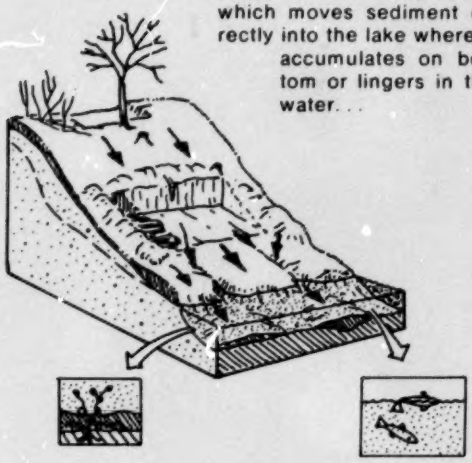
STEEP SLOPES



Though often highly attractive as building sites, steep slopes such as this pose many problems to the landowner which can result in economic losses and severe damage to the lake . .

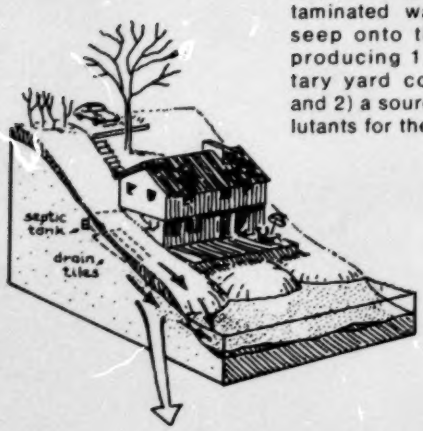
For example. . .

In order to provide flat ground for a foundation, excavation is necessary. The exposed soil is very prone to erosion by runoff which moves sediment directly into the lake where it accumulates on bottom or lingers in the water. . .



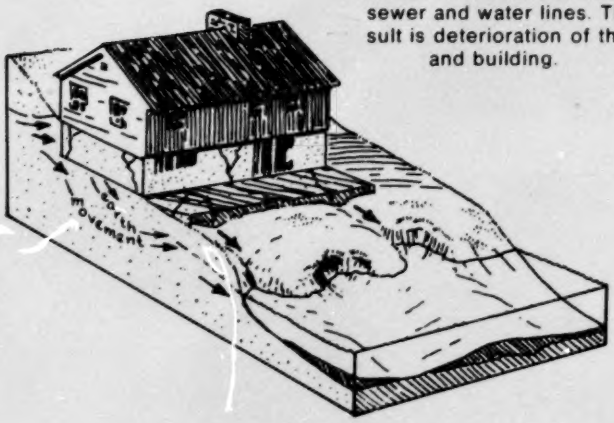
And. . .

Owing to the fact that septic drain tiles must be laid about 18 inches below the surface and at a very gentle incline, the downslope ends of the tiles may fall within inches of the soil surface. As a result, contaminated water may seep onto the lawn, producing 1) unsanitary yard conditions and 2) a source of pollutants for the lake.

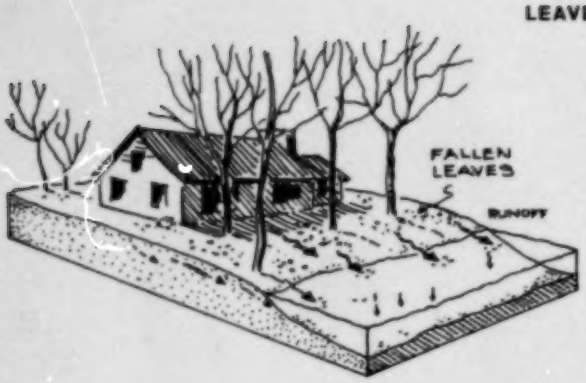


And. . .

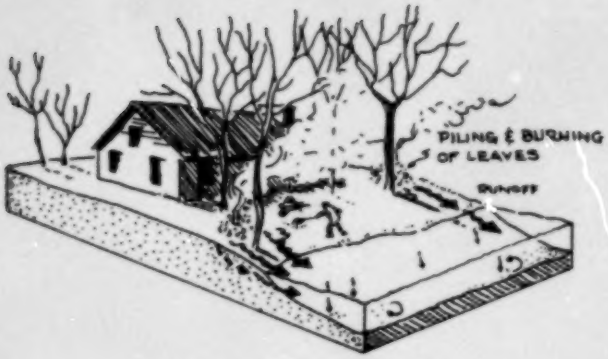
Steep slopes are subject to earth movement, especially where they have been disturbed by excavation and deforestation. Although the amount of movement around lakes is usually small, it is often enough to crack foundations, tilt basement walls and damage sewer and water lines. The result is deterioration of the site and building.



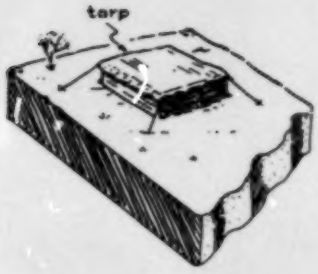
LEAVES AS A SOURCE OF PHOSPHORUS

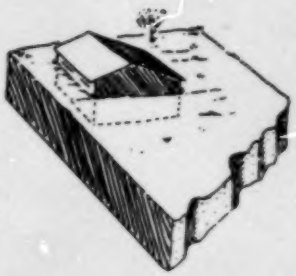


Each fall, large amounts of leaves are carried into inland lakes by runoff and wind. As the leaves decompose, the chemical phosphorus is released, thereby enriching the water and in turn fostering aquatic weed growth.



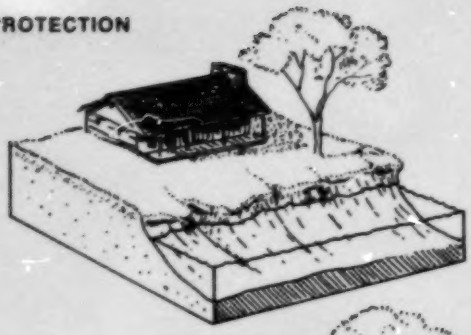
Residents often pile and burn the leaves which fall in their yards, but unfortunately this too can result in phosphorus enrichment of the lake. Burning only concentrates phosphorus in the ashes which are easily washed into the lake by runoff.



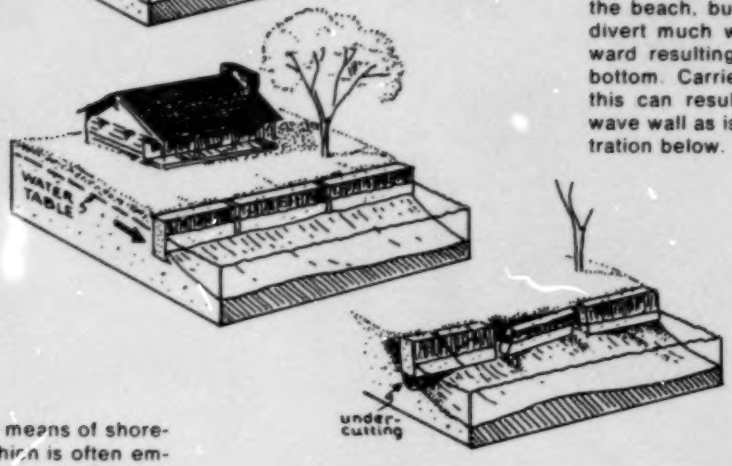


Several steps may be taken to limit the effects of leaves on inland lakes. **First,** residents should refrain from burning altogether. **Second,** an effort should be made to retain runoff on the site. This may be done with the aid of a small berm or greenbelt on the lake front. **Third,** leaves should be collected and placed in a compost container near the rear of the site. Two types of containers are illustrated on the right and both are designed to prevent phosphorus from being washed out of the decomposing leaves by rain and runoff. Once this system is operating, decomposition should keep pace with the annual leaf fall.

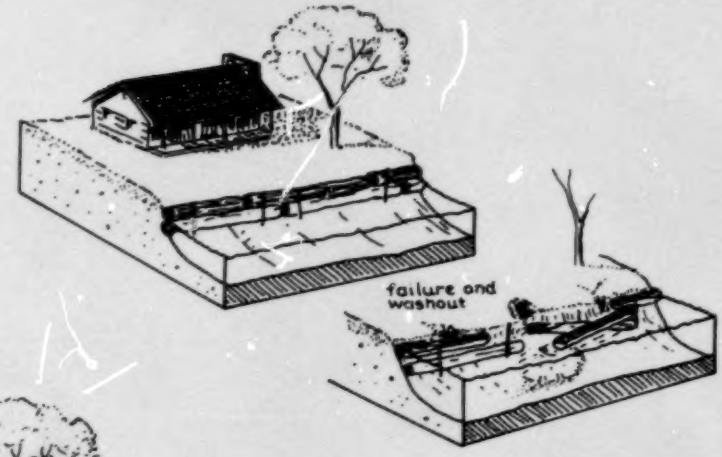
SHORE PROTECTION



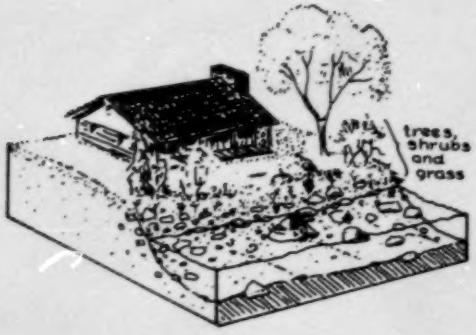
Shoreline erosion has become an increasingly difficult problem on inland lakes and property owners are often forced to provide some form of shore protection against wave attack. Many different devices have been constructed and most are at least partially effective in stabilizing the shoreline. Some of the most expensive and often least effective devices are vertical wave walls. Not only can they be unsightly and a hinderance to use of the beach, but they also tend to divert much wave energy downward resulting in erosion of the bottom. Carried to the extreme, this can result in failure of the wave wall as is shown in the illustration below.



A less expensive means of shoreline protection which is often employed is the log wall. Besides wave undercutting, two additional problems often beset this inexpensive device: (1) if the logs are not bolted and anchored, they may float away during high water and (2) water which penetrates the cracks between logs and water from wave overwash can continue to erode the shore behind the wall as portrayed on the right.

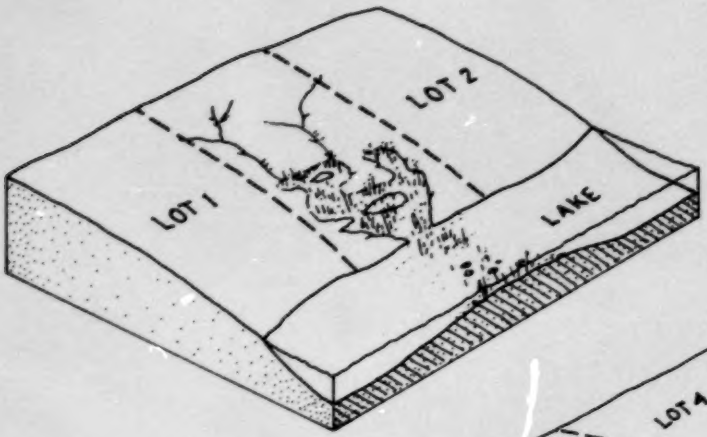


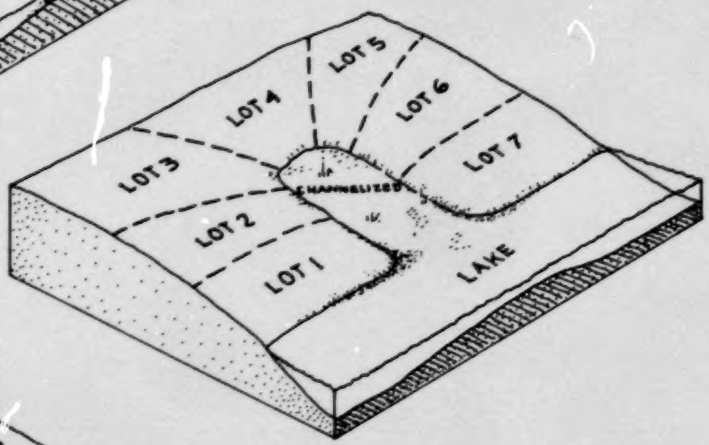
What to do? Nature can provide some clues. Trees and other plants are known to be effective controls against erosion by small waves and runoff. If combined with cobbles and boulders placed on and just off the shore, as the accompanying diagram suggests, wave erosion along most inland lakes can be reduced to tolerable levels and much of the scenic quality of the shoreline can be preserved. Should these measures prove inadequate, professional advice is probably necessary.

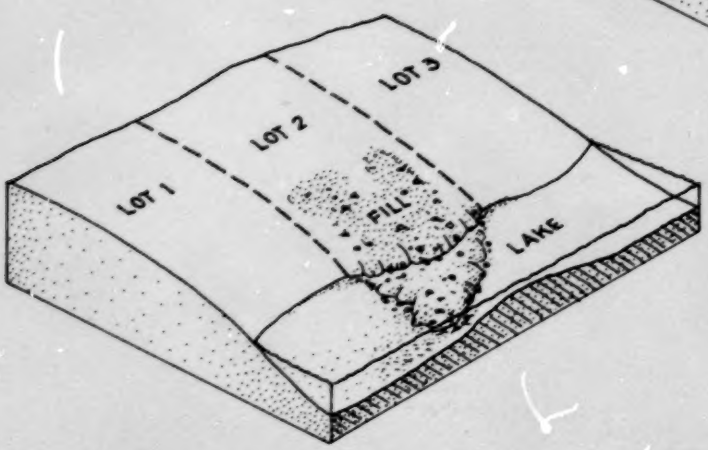


CHANNELIZATION AND LANDFILL

Channelization and filling along the shores of inland lakes is a common development practice. On first thought it sometimes seems that channelization or the filling of wetlands would have little consequence in lake management. However, it is easy to demonstrate that its consequences can be severe. First, channelization increases the length of a lake's shoreline, thereby providing more frontage land for development. This, in turn, increases the contact between land use activities and the lake. Channelization of the small wetland shown in the diagram results in an increase in frontage lots from 2 or 3 to as many as 7. Second, in the case of landfills, not only is development land increased, but valuable wetlands are usually obliterated. These wetlands serve several important **ecological functions:** (1) they are often sources of ground water which feed the lake (2) they are filters for the runoff from the land and (3) they are important habitats for wildlife.



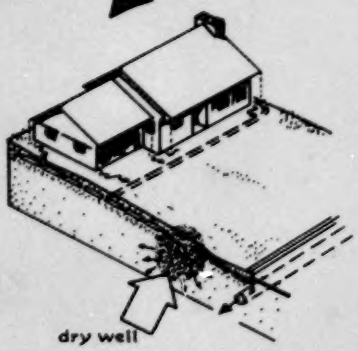


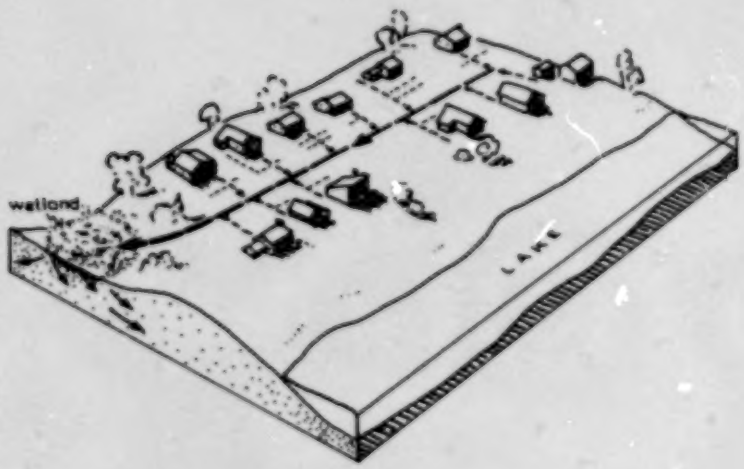


Michigan Bill 346 (1972) is designed to reduce channelization and land filling activities around inland lakes. Under this bill landowners and developers are required to seek a permit from the DNR for any dredging or filling operation which will affect the land below the high water mark of a lake. **This law** can also apply to shoreline stabilization projects which propose construction on the beach and off shore.

STORM SEWER RUNOFF

In the past, both sanitary sewage and storm water from residential areas were discharged directly into natural waters. Now nearly all sanitary sewage is treated in some way before entering rivers and lakes. **Unfortunately**, this is not so with storm water. Long thought to be more or less harmless, measurements show that runoff discharged through modern storm sewers is frequently heavy with chemicals, bacteria and sediment. Exposed soil, animal excreta, fertilizer, auto exhausts, oil and ashes are some of the typical contributors. Where storm sewers from large tracts of developed land empty into a lake, a decline in lake water quality is almost certain. In fact, the decline can be so serious that it may offset the favorable effects of an otherwise sound planning and management program.

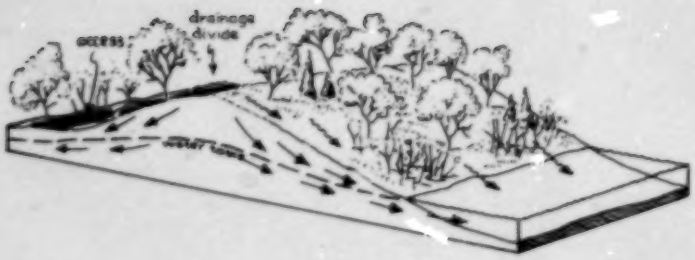




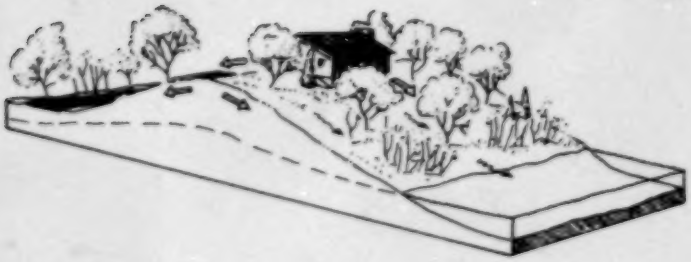
The choice of an **acceptable alternative** to the storm water problem depends mainly on local soil and drainage conditions, and in most cases, the advice of a drainage specialist is recommended. On-site disposal is possible where soils are sandy and well drained. The illustration directly above shows one type of "dry well" which can be used by property owners. For small communities, storm water can sometimes be diverted into nearby lowlands as the illustration on the upper right suggests. Although soil and plants will filter out many of the pollutants, such a site can in time become unsightly. This, however, is a necessary trade-off that must often be made to preserve lake quality in developed areas.

SETBACK FROM THE SHORE

For most of us it is difficult to resist the urge to live at the waters edge; however, from an environmental standpoint it is decidedly wiser to locate houses and cottages a considerable distance inland from the shoreline. **As a general rule,** it would be advisable for lake property owners to observe a setback from the bank of at least 200 feet. However, this rule need not be an absolute one, because where the terrain is varied, setback distance may be adjusted to the particular site conditions. For the site shown on the upper left, the critical condition is the location of the drainage divide. Should the house be built on the lake side of the divide, as is shown in the second drawing, poor quality drainage from the yard will move directly to the lake.



Least Advisable

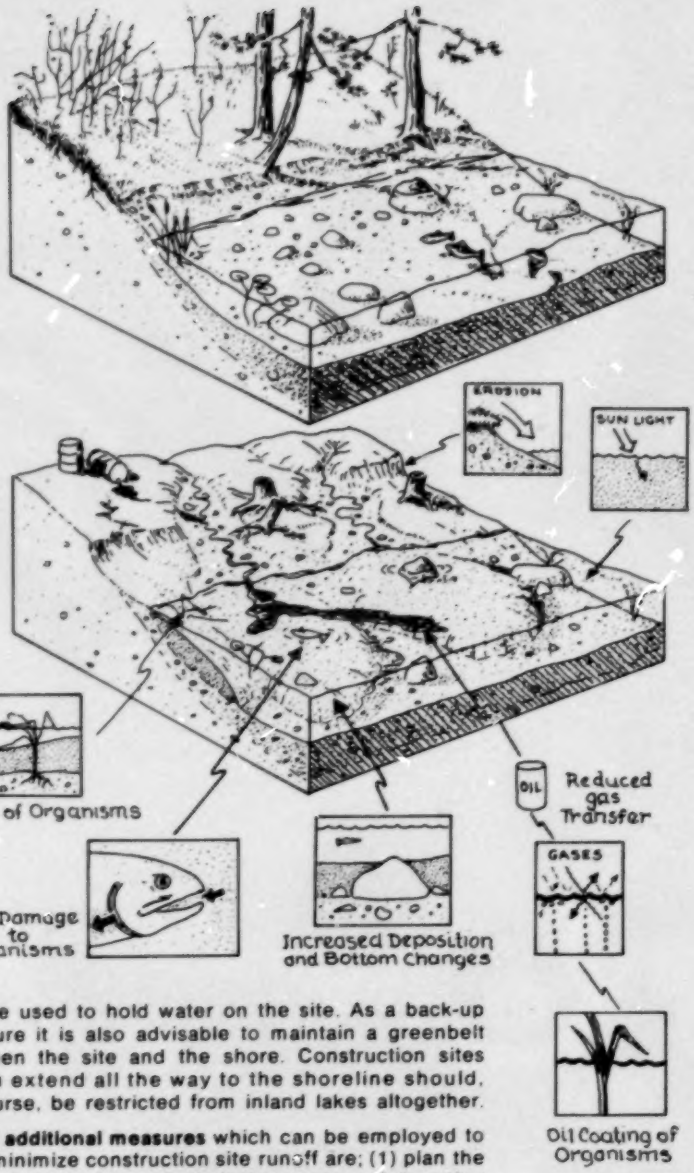


The situation shown in the third drawing is somewhat better because only about half the yard drainage is able to move to the lake. **The best arrangement,** however, is clearly the last one in which most of the yard drainage is restricted to the landward side of the rise. With this site design, property owners can limit the influence of land use activities on the lake, particularly if much of the natural vegetation is left on the lakeward slope. Finally, it is important to add that on all sites septic systems should be set back at least 100 feet from the shore.

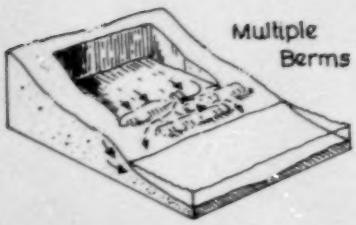
Most Advisable

ENVIRONMENTAL HAZARDS OF THE CONSTRUCTION SITE

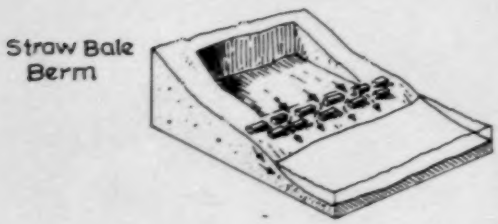
The formation of construction sites is one of the most harmful events that can occur near inland lakes. With modern land clearing and excavation techniques, sites such as the one shown on the right can be quickly changed into sources of runoff, sediment, oil and other pollutants. The influence of these on the lake environment may be extremely severe; spawning beds and aquatic plants can be buried, lake water can become loaded with sediments and oil slicks can form on near-shore water.



The key to reducing the environmental damage associated with construction sites appears to lie in the control of site runoff. In response to this problem, the State passed the **Soil Erosion and Sedimentation Control Act** (1972). Under this law a permit is required for construction sites located within 500 feet of a lake or stream. Approval of a permit application requires that the builder observe a number of measures to prevent site erosion and related sedimentation of natural waters. As the illustrations below suggest, several inexpensive methods of berming can be used to hold water on the site. As a back-up measure it is also advisable to maintain a greenbelt between the site and the shore. Construction sites which extend all the way to the shoreline should, of course, be restricted from inland lakes altogether.

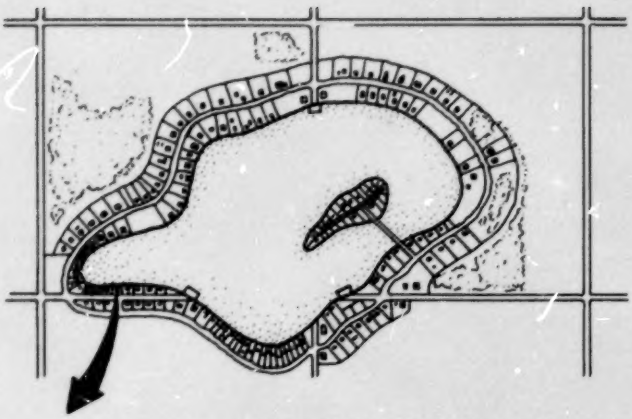


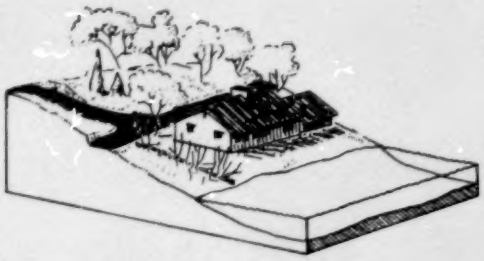
Some additional measures which can be employed to help minimize construction site runoff are; (1) plan the construction program to limit the number of days that the site is left open, (2) avoid construction during seasons of high runoff, i.e., spring in the northern part of the State and winter and early spring in the southern part of the State, (3) if the site must be left open for an extended period of time, secure burlap, straw or a similar cover to the berm and the steep slopes to protect them from erosion.



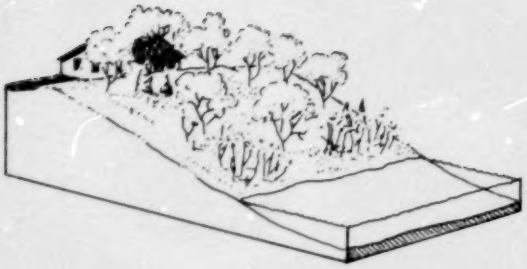
PLANNED DEVELOPMENT

Many lake management problems stem from the haphazard development of road networks and summer cottages. Lake access roads typically hug the shoreline and follow topographic ridges as they encircle a lake. As a result, a narrow ribbon of land is often carved out along the shore which encourages subdivision of frontage property into small and irregularly shaped parcels. This pattern severely limits the number of development alternatives for effective lake planning and management. Lots are generally too small for adequate septic tank drainage and building set back from the shore is usually inadequate to avoid direct runoff from the yard into the lake.

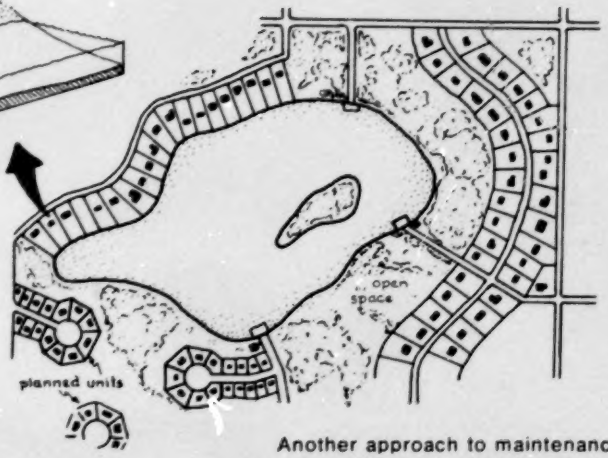




The adjacent illustrations indicate the typical nature of this problem. The ring access road has given rise to a single tier of narrow, small lots. Structures built on the lots are crowded close to the lake shore and close to each other. In developing small parcels, most vegetation must be eliminated to make way for the structures. As summer cottages are converted to year-round homes, the intensity of land use and the amount of impervious surface increase correspondingly, resulting in more runoff of lower quality.



Several alternatives may be employed to avoid these problems. Deeper lots for single homes and cottages (above) or "planned unit developments" (right) provide more flexible opportunities for pleasing and environmentally sound development.



Another approach to maintenance of an open and usable shoreline is to create waterside parks or open spaces backed by lots overlooking the lake. Such an arrangement discourages overdevelopment of shore lands, yet affords use of the shore by residents as is suggested by the right side of the diagram above.

THE CASE OF HOUGHTON LAKE

Owing to its size, its attractive shoreline and its central location in the Lower Peninsula, Houghton Lake has long been highly attractive for summer and winter recreation as well as a place of residence. As a result, development around the lake has flourished, including the growth of several communities. The accompanying map shows the major areas of development in relationship to the main drainage features of the Houghton Lake watershed.

In the 1960's, the citizens and public officials in the Houghton Lake area became concerned over rumors of a decline in the lake's water quality. Funds were obtained from the Upper Great Lakes Commission for the DNR to ascertain the lake's true water quality. The findings are encouraging and helpful.

Despite the rumored signs, the DNR studies indicate that the present water quality of Houghton Lake is good. However, the studies also highlight some problems related to the disposal of domestic sewage through septic drain systems. It appears that continued use of septic systems in densely developed areas will lead to serious nutrient loading of lake water.

Two local programs were initiated to help avert deterioration of Houghton Lake. One involves the construction of a sanitary sewer system and sewage disposal facilities. A central sewage system insures that domestic wastes do not enter the lake, but are taken to a safe location for treatment and disposal. Although the effect of this program on lake water quality will not be immediate, its benefits will certainly be realized in the years to come.

The second program is an environmental education program undertaken by various private and public organizations including the Cooperative Extension Service. This program is designed to provide information to property owners to assist them in land and water management efforts.

SUPPLEMENT A

Michigan Governmental Agencies Responsible for Inland Lake Water Quality Protection

Problem Area	Responsible Governmental Units*	Telephone
Aquatic Plants and Algae Inland Lake Management Industrial Discharges to Inland Lakes	Department of Natural Resources Water Quality Control Division	(517) 373–8000
Soil Erosion and Sedimentation	Department of Natural Resources Water Quality Control Division	(517) 373–1947
Municipal Wastewater Discharges	Department of Natural Resources Wastewater Division	(517) 373–3710
Dredge and Fill Permits Lake Boards Lake Levels	Department of Natural Resources Hydrological Survey Division	(517) 373–3930
Lake Use Zoning	Department of Natural Resources Law Division	(517) 373–1230
Public Access	Department of Natural Resources Waterways Division	(517) 373–0626
Septic Tank Discharges	Department of Public Health and County Health Department	(517) 373–1360
Fisheries	Department of Natural Resources Fisheries Division	(517) 373–1280 or DNR District Office

*Michigan Department of Natural Resources, Stevens T. Mason Building, Lansing, Michigan 48926
Michigan Department of Public Health, 3500 North Logan, Lansing, Michigan 48906